

and also atavistic phenomena are to be explained, the latter showing that the ids whose action is neutralized are not destroyed.

While one-half reduction takes place in bryophytes, pteridophytes and phanerogams in spore mother-cells, in the lower cryptogams, where the oospore does not give rise to a definite sporophyte, the reduction probably takes place on the germination of the oospore. This reduction is the return of the most highly organized plants, at the close of their life cycle, to the unicellular condition, the repetition of phylogeny in ontogeny.

In carefully comparing the generative processes of animals and plants it becomes evident that there is nothing in plants which corresponds to the polar bodies of animals, and that such reference of the ventral canal-cells of archegoniates is without foundation.

The spore mother-cell, therefore, is to be regarded as the first term of the new generation. The center of gravity of the developmental processes which take place in sporangia does not lie in the cells styled the "archesporium," which still belongs to the asexual generation, but in the spore mother-cells. It is of little importance whether there be a well-defined archesporium or not, as it is merely the meristematic tissue from which the spore mother-cells are derived, so that its differentiation cannot be of any special significance.—J. M. C.

### Anatomy of the genus *Carex*.

It seems very natural that a genus so large as *Carex*, estimated to contain about 800 species, has caused considerable trouble to the systematists in regard to the most natural arrangement of the numerous species. The modern discrimination of species by means of anatomy is far from always to be applied as a support for the systematic position of species in natural groups; this is only too manifest, when we compare the results gained by recent investigations. And with the genus *Carex*, we are far from through yet, though the present time seems to throw some light upon the conception of the true relationship among the species. Valuable assistance has been rendered to students of this genus by the authors who have made a special study of the anatomy of a number of species. Bordet<sup>1</sup> and Mazel<sup>2</sup> have given several anatomi-

<sup>1</sup> Recherches anatomiques sur le genre *Carex*. *Revue générale de Botanique*, 3: 57. 1891.

<sup>2</sup> Etudes d'anatomie comparée sur les organes de végétation dans le genre *Carex*. 1—213. *pl.* 7. 1891. [Thèse. Genève.]

cal details of many species of this genus, and we have now received a still more comprehensive treatise by Lemcke,<sup>3</sup> wherein an attempt has been made to arrange the species in natural groups by means of their anatomical characters.

The first chapter of this interesting and important work contains a review of the literature upon this subject.

The author has studied especially the internal structure of the rhizome, but several points of interest have also been given in regard to the anatomy of the aerial stem and the leaf. Boeckeler's system<sup>4</sup> has been followed as a basis in the present investigation.

The material examined includes representatives from Europe and North America, so that the paper becomes very helpful to similar studies in this country.

Very little has been added to the results given by earlier authors, and the most essential points seem to have been already discovered. The important studies of Klinge, Laux, Mazel and Schwendener seem to contain all of the salient features in the structure of this genus, but the present paper embodies the first attempt to arrange the species anatomically.

It would be impossible to give a satisfactory review of all the anatomical peculiarities in condensed form, and we therefore restrict ourselves to a brief comparison of some of the results.

The author has found the anatomical structure of the rhizome sufficient for the discrimination of the various groups, and in many instances the species are readily distinguished. The system suggested by Christ,<sup>5</sup> seems to be the most natural, although the author admits that he was not able to find in anatomical characters sufficient foundation for several of the sections in this system.

The arrangement of the species in Heterostachyæ, Homostachyæ, Cephalophoræ and Monostachyæ in the system of Christ is widely different from that which has been proposed by Bailey.<sup>6</sup> For instance: Christ refers *CC. obtusata*, pyre-

<sup>3</sup> A. LEMCKE: Beiträge zur Kenntniss der Gattung *Carex*. 1-130. 1892. [Inaug. Dissert. Königsberg in Pr.]

<sup>4</sup> Die Cyperaceen des königlichen Herbariums in Berlin. *Linnæa* N. S. 5-7:—1875-77.)

<sup>5</sup> Nouveau catalogue des *Carex* d'Europe. *Comptes-rendus d. séances de la Société Roy. de Botanique de Belgique* 24:—. 1885.

<sup>6</sup> A preliminary synopsis of North American *Carices*. *Proceed. of American Academy of Arts and Sc.* 22:—. —.

naica, microglochin, gynocrates, and dioica to a section "Psyllophoræ" and *C. capitata* and *C. scirpoidea* to "Capitata," both sections of the group *Monostachyæ*. These species are widely separated from each other in the system of Bailey, so far even that *C. microglochin* has been enumerated as no. 1 under the section "Physocarpæ," *C. scirpoidea* as no. 184 under *Sphaeridiophoræ*, *C. pyrenaica* as no. 211 under *Lamprochlaenæ*, *C. obtusata* as no. 215 in the same section, while the remaining *C. capitata*, *C. gynocrates*, and *C. dioica* as nos. 255, 258, and 259 under the section *Acroarhenæ*.

Lemcke shows now that these species are most naturally combined in one single section, *Psyllophoræ*, of the *Monostachyæ*. *C. pyrenaica* and *C. scirpoidea* are closely related to each other by having subepidermal groups of stereome in their rhizomes, which the others have not. *C. pyrenaica* has thick walled epidermis cells, while these are papillose-prominent in *C. scirpoidea*. *C. Fraseri* is closely related to these two species.

Tangential aeriferous lacunes are present in the bark of *C. capitata* and *C. gynocrates*, while these are radial in *C. dioica* and *microglochin*. *C. dioica* has a closed sheath of stereome around the mestome bundles, which is not observed in *C. microglochin*. It is to be seen from these investigations that we meet with great discrepancies in regard to the anatomical structure if we compare the species as they have been arranged by Bailey. The large number of well differentiated species in proportion to the relatively few morphological characters makes it exceedingly difficult to reach even an approximation to a truly natural classification, but we should not be surprised if extended studies justify the system given by Drejer in his excellent treatise, *Symbolæ Caricologicæ*.—THEO. HOLM.